



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(4): 448-450
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www.thepharmajournal.com
Received: 14-02-2021
Accepted: 23-03-2021

Ramsawroop
Department of Animal Nutrition
LUVAS, Hisar, Haryana (India)

VS Panwar
Department of Animal Nutrition
LUVAS, Hisar, Haryana (India)

Sandeep Kumar
Department of Animal Nutrition
LUVAS, Hisar, Haryana (India)

Gunjan
Department of Animal Nutrition
LUVAS, Hisar, Haryana (India)

Corresponding Author:
Ramsawroop
Department of Animal Nutrition
LUVAS, Hisar, Haryana (India)

Mineral composition of green and dry roughage in Charkhi Dadri District of Haryana

Ramsawroop, VS Panwar, Sandeep Kumar and Gunjan

Abstract

An extensive survey was conducted to find out the mineral composition of dry and green roughage in Charkhi Dadri district of Haryana state during *Rabi* season. To have a systematic and planned study all the four blocks were included and total 120 farming families were selected for the study. A questionnaire was prepared and individual farmer was interrogated regarding the type of feedstuffs and their amount fed to their animals. The samples of straws (wheat, rice and bajra straw), fodders (barseem, oat and grasses) and concentrate ingredients (cotton seed cake and wheat) offered to animals were collected from each village and analysed for minerals. Majority of the farmers were using wheat straw (90.8%). Results of mineral analysis reveal that wheat straw was deficient in Ca (0.21%) and P (0.7%) concentration in terms of daily dietary requirement. Zn and Cu were also found deficient while Iron content was reported higher than daily dietary requirement in all the straws. The mean Mn concentration of wheat straw samples was found slightly lower than critical limit. During the season berseem was the most preferred green fodder fed by of farmer of Charkhi Dadri i.e., 73.3% of farmers were feeding barseem in the district. Results of mineral analysis reveal that barseem had adequate Ca and P concentrations (1.06% and 0.27% respectively) which is sufficient to meet daily dietary requirement. Zn and Cu were found deficient while Iron content was reported higher than dietary requirement in barseem fodder. The mean Mn content of barseem fodder was found close to daily requirement in Badhra block i.e., 41.39 ppm.

Keywords: Minerals, green fodder, barseem, wheat straw, Charkhi Dadri, *Rabi* season

Introduction

India is predominantly an agrarian society where lactating animals are the backbone of national economy. Over 65% of the population in India is still living in rural areas and most of them are dependent on agriculture and livestock for their livelihood. Low milk yield per animal is mainly due to feeding of poor-quality feed resources, particularly crop residues and agro industrial by-products fed to animals in rural households (Sherasia *et al.*, 2016)^[11]. Being tropical country mineral deficiency in India is quite common and is mainly due to deficiency of minerals in soil and forage. Also, with intensive cropping system and extensive fertilizer application the mineral profile in soil and thus in plants or animal chain are rapidly changing. Therefore, analysing mineral content of feedstuffs is of utmost importance.

Materials and Methods

Charkhi Dadri is recently created 22nd districts of Haryana state in northern India. Multi-stage stratified random sampling procedure was adopted for the selection of villages. Four blocks of Charkhi Dadri district namely Badhra, Jhojhu, Bond Kalan and Charkhi Dadri were selected purposively for the survey study. Three villages were purposefully selected from each block representing status of their block. 10 families per village were selected, thus a total of 120 farming families were selected for the study. A questionnaire was prepared keeping in mind the objectives and various dimensions of the study. Individual animal owner was interrogated regarding the type of feedstuffs (dry fodder, green fodder, grains, cakes, mineral mixture and common salt) and their amount fed to their animals. The samples of straws, fodders and concentrates ingredients offered to animals were collected. The collected samples were dried and ground then analysed for the concentration of Zn, Cu, Mn, and Fe using Perkin Elmer Atomic Absorption Spectrometer (PinAAcle 900T). Calcium and Phosphorus content in feeds and fodders were estimated as per AOAC (2007)^[11]. The data was statistically analysed as per statistic methods of Snedecor and Cochran (1994)^[13].

Results and Discussion

Green Fodder

Table 1: Mineral Composition of berseem in different blocks of Charkhi Dadri district

	Ca(%)	P(%)	Zn(ppm)	Cu(ppm)	Fe(ppm)	Mn(ppm)
Badhra	1.06±0.07	0.22±0.02	26.3±0.52	5.55±0.44	185.96±2.28	41.39±2.12
Jhojhu	1.15±0.08	0.28±0.04	19.67±0.91	3.93±0.10	180.30±4.21	35.52±1.25
Bond Kalan	1.01±0.06	0.33±0.03	23.92±0.83	2.97±0.12	199.70±5.11	29.31±1.14
Charkhi Dadri	1.03±0.11	0.27±0.02	18.55±0.28	3.16±0.19	186.74±3.94	27.84±0.68
Mean	1.06±0.06	0.27±0.02	22.11±0.35	3.90±0.24	188.17±2.85	33.51±1.17
Range	0.96-1.17	0.20-0.37	16.17-29.53	2.18-6.42	140.01-210.31	25.18-46.75
Critical level*	<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

± Standard error of mean *As per McDowell *et al.* (1993)^[9]

Home grown berseem was the major green roughage being fed by farmers in almost all the villages of Charkhi Dadri district under investigation. Mineral composition of berseem in different blocks of Charkhi Dadri district is given in Table 1. The Ca content in berseem ranged from 0.96 to 1.17% and had an average value of 1.06%. The concentration of P in berseem ranged from 0.20% to 0.37%. Among the blocks, the average P content ranged from 0.22% in Badhra block to 0.33% in Bond Kalan block. The Ca and P concentrations are more than their critical level i.e., 0.30% and 0.25%, respectively except in Badhra block where P was deficient. Similar results were also reported by Maan (2000)^[7] in a study conducted in Bhiwani district of Haryana.

The average values of Zn concentration in berseem of different blocks were 26.30, 19.67, 23.92 and 18.55 ppm. Concentrations of Zn, considering the whole data, ranged from 16.17-29.53 ppm. Zn was highly deficient in all the samples as its level was below critical level i.e., 30 ppm. Dhore and Udar (2007)^[4] reported that the mean value of Zn in fodder was less than 25.06 ppm in Western Agro Climatic Zone of Vidarbha. Garg *et al.* (2008)^[6] found that Zinc was acutely deficient in most of the feedstuffs (mean level < 26.30 ppm) in Bharatpur district.

The Concentration of Cu, considering the whole data, ranged from 2.18-6.42 ppm. Considering 8ppm as critical limit, all the samples were deficient in the district. Garg *et al.* (2008)^[6] found that the mean value of Cu in green fodders was 9.68 ppm. Bhandari *et al.* (2013)^[3] while surveying the Sabarkantha District of Gujarat reported that green roughages were good source of copper (12.31 ppm).

The average Fe content of district was 188.17 ppm and ranged from 140.01-210.31 ppm. none of the samples were deficient in the district from its critical level (50 ppm) and same was reported in other studies conducted in Haryana (Baloda, 2016)^[2].

The concentration of Mn in berseem ranged from 25.18-46.75 and had an average value of 33.51 ppm. Among the blocks, the average Mn concentration ranged from 27.84 ppm in Charkhi Dadri block to 41.39 ppm in Badhra blocks. Some samples were above critical value (40 ppm). Otherwise, as a whole data, district was deficient in Mn content. These mean value lines parallel with Dhore and Udar (2007)^[4]. Maan 2000^[7] reported 13.46 ppm of Mn content in barseem fodder.

Dry Roughage

Table 2: Mineral composition of wheat straw in different blocks of Charkhi Dadri district

	Ca(%)	P(%)	Zn(ppm)	Cu(ppm)	Fe(ppm)	Mn(ppm)
Badhra	0.22±0.04	0.06±0.03	24.14±0.30	3.24±0.31	167.53±12.70	35.21±1.24
Jhojhu	0.23±0.05	0.06±0.04	23.95±0.48	3.10±0.29	165.93±13.10	33.83±2.37
Bond Kalan	0.19±0.03	0.08±0.03	18.82±1.55	4.71±0.35	116.53±7.19	21.52±1.53
Charkha Dadri	0.21±0.02	0.07±0.02	22.63±1.18	2.52±0.53	141.85±9.11	18.42±2.04
Mean	0.21±0.02	0.07±0.01	22.38±0.59	3.39±0.21	147.96±4.92	27.24±0.79
Range	0.16-0.26	0.04-0.09	15.18-28.24	1.57-7.28	80.94-221.74	15.18-40.35
Critical level*	<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

± Standard error of mean *As per McDowell *et al.* (1993)^[9]

Main dry roughage fed to the animals in the district was wheat straw. It was being fed by farmers at all the sites surveyed and was preferred choice of all the farmers in the district. Mineral composition of wheat straw in different blocks of Charkhi Dadri district is given in Table 2. The concentration of Ca (%) in wheat straw ranged from 0.16 to 0.26 and had an average value of 0.21. All the samples were below critical limit (0.30%).

The concentration of P (%) in wheat straw ranged from 0.04 to 0.09 and had an average value of 0.07. The P concentration was below critical limit (0.25%) in all the samples. Samples of wheat straw were highly deficient of P. All the dry roughages were poor in Ca and P. Similar to this Garg *et al.* (2008)^[6] reported that the mean calcium content in straws (0.34%) was higher in comparison to phosphorus (0.10%) in Bharatpur district of Rajasthan and Gami *et al.* (2013)^[5] also

said in a survey conducted in Dantiwada taluka in North Gujarat region, that dry roughages were good source of calcium but poor in phosphorus content. According to Maan (2000)^[7] the mean Ca and P content of wheat straw was 0.23 and 0.09% respectively in the survey conducted in Bhiwani district.

The average Zn concentration was 22.38 ppm and had ranged from 15.18-28.24 ppm. Samples were deficient of Zn as its level was below critical limit (30 ppm). Zn mean values was in same pattern of Singh (1977)^[12] who observed that the Zn content in wheat straw varied from 16.34 to 24.75 mg/kg. Mandal *et al.* (1996)^[8] reported that the mean Zn content in wheat straw was 18.25 mg/kg.

Concentrations of Cu, considering the whole data, varied from 1.57-7.28 ppm. The average value of Cu content was highest (4.71 ppm) in block Bond Kalan and the lowest (2.52 ppm) in

block Charkhi Dadri (Table 2). Considering 8ppm as critical limit, all the samples were highly deficient of Cu in the district. Above result was in alignment with Mandal *et al.* (1996) [8] and he reported that the mean Cu content in wheat straw was 3.56 mg/kg. This might be due to deficiency of Cu in soil of the district. Dry roughages are mostly deficient in Cu because in most circumstances Cu concentration declines as plant mature (McDowell, 1985) [10].

The average Fe content of district was 147.96 ppm and had ranged from 80.94-221.74 ppm. Considering 50 ppm as critical limit, none of the samples were deficient in the district. Same was reported in similar studies conducted by Maan (2000) [7] and Baloda (2016) [2]

The concentration of Mn (ppm) in wheat straw ranged from 15.18-40.35 and had an average value of 27.24 in the district. Most of the samples contained Mn below critical value (40 ppm). According to Maan (2000) [7] mean Mn content of wheat straw was 38.25 ppm which ranged from 10.10 to 57.22, while Baloda (2016) [2] in survey conducted in Gurgaon district found that Mn content of wheat straw ranged from 36.89-54.04 ppm.

From the study, we can conclude that berseem was used as green fodders by majority of farmers which had adequate Ca, P and Fe content but was deficient in Zn, Cu and Mn having an average value of 22.11, 3.09 and 33.51 ppm, respectively. Wheat straw was used as dry roughage by majority of farmers. Wheat straw and rice straw were deficient in Ca, P, Zn, Cu and Mn. Fe content was adequate in all the straw samples.

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